

C L A I M S

1. Process for the removal of carbon dioxide and optionally hydrogen sulphide and/or COS from a gas stream containing these compounds by washing the gas with an aqueous washing solution containing between 15 and 45 parts by weight based on total solution of water, between 15 and 35 parts by weight based on total solution of sulfolane and between 30 and 60 parts by weight based on total solution of a secondary or tertiary amine derived from ethanol amine, the amounts of water, sulfolane and amine together being 100 parts by weight, the process being carried out in the presence of a primary or secondary amine compound in an amount between 0.5 and 15 wt% based on water, sulfolane and amine.

2. Process according to claim 1, in which the gas stream is natural gas or synthesis gas.

3. Process according to claim 1 or 2, in which the amount of carbon dioxide is between 1 and 45 mol%, preferably between 5 and 25 mol%, the amount of hydrogen sulphide is between 0 and 25 mol%, preferably between 0 and 10 mol%, and the amount of COS is between 0 and 2 mol% (all % based on total gas stream).

4. Process according to any of claims 1 to 3, in which the amount of water is between 20 and 45 parts by weight, the amount of sulfolane is between 20 and 35 parts by weight and the amount of amine is between 40 and 55 parts by weight, the amounts of water, sulfolane and amine together being 100 parts by weight.

5. Process according to any of claims 1 to 4, in which the secondary amine derived from ethanolamine is DIPA, DEA or MMEA, preferably DIPA.

6. Process according to any of claims 1 to 4, in which the tertiary amine derived from ethanolamine is MDEA or DEMEA, preferably MDEA.

7. Process according to any of claims 1 to 6, in which the primary or secondary amine compound has a pK_b (at 25 °C in water) below 5, preferably below 4.5.

8. Process according to any of claims 1 to 6, in which the primary or secondary amine compound reacts at least twice as fast with carbon dioxide then the amine reacts with carbon dioxide, the reaction velocity defined by the reaction velocity constant (at 25 °C), the primary or secondary amine compound preferably reacting five times as fast as the amine, more preferably reacting twenty times as fast as the amine.

9. Process according to any of claims 1 to 8, in which the primary or secondary amine compound is piperazine, methyl ethanol amine, or (2-aminoethyl)ethanol amine, especially piperazine.

10. Process according to any of claims 1 to 9, in which the amount of primary or secondary amine compound is between 2.5 and 10 wt%.

11. Process according to any of claims 1 to 10, in which the amount of primary or secondary amine compound is at least 0.8 mol/l, especially between 1.0 mol/l and 3.0 mol/l, more especially between 1.0 mol and 3.0 mol piperazine/l.

12. Process according to any of claims 1 to 11, in which the process is carried out at a temperature of at least 20 °C, preferably between 25 and 90 °C, more preferably

20 °C, preferably between 25 and 90 °C, more preferably between 40 and 65 °C at a pressure between 25 and 90 bara.

13. Process according to any of claims 1 to 12, which process also comprises a regeneration of the loaded solvent.

14. Process according to any of claims 1 to 13, in which the process is carried out a pressure between 25 and 90 bara, in which process the loaded solvent is flashed of at a pressure between 1 and 15 bara, followed by regeneration at a pressure between 1 and 2 bara.

15. An absorbent liquid containing between 15 and 45 parts by weight based on total solution of water, between 15 and 40 parts by weight based on total solution of sulfolane and between 30 and 60 parts by weight based on total solution of a secondary or tertiary amine derived from ethanol amine, the amounts of water, sulfolane and amine together being 100 parts by weight and a primary or secondary amine compound in an amount between 0.5 and 15 wt% based on water, sulfolane and amine.

16. An absorbent liquid as defined in claim 15, the individual compounds further defined as in claims 4, 5, 6, 7, 8, 9, 10 or 11.